

OBSERVER



STELLAR HOLIDAY SIGHTS

THE HORSEHEAD NEBULA

The beautiful Horsehead nebula (center) is made of dark dust in front of an emission nebula (red). The bright nebula to the lower left of the Horsehead is the emission nebula NGC 2024. The bright star at upper left is the middle star in Orion's belt, called Anilam, and the bright star to the left of the Horsehead and above NGC 2024 is the eastern end star of Orion's belt.

The Horsehead nebula is visible in 11- or 15-inch diameter telescopes from a dark site, but the detail shown in this image would require about a 1-meter aperture (about 40-inch) telescope to see. Please see www.clarkvision.com for technical details.

Image © Roger Clark

Calendar

- 2.....New moon
- 9..... First quarter moon
- 17..... Full moon
- 21..... Winter Solstice
- 25..... Last quarter moon

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DECEMBER SKIES

by Dennis Cochran

Onrushing ISON the Comet swoops eastward in late November towards the sun and rounds it sharply on November 28, afterwards heading northwest. When a comet is near the sun it's a daytime object that's hard to see. It might also be destroyed in its brush with our star. Another aspect of its sun-grazing orbit is that the pressure of the solar wind on the comet will probably create the longest tail of its flight. We'll all be watching. We now know ISON, or part of it, survived its sun-scraper. ISON should be a twilight object early in the month and an evening object around Christmas, passing the lower right corner of Ophiuchus's bell shape on the 6th and then a bit east of the head triangle of Serpens Caput on the 16th before it heads up through the western part of Hercules. How bright it will be remains to be seen. There are ISON observing infor-

mation and maps in the December Sky & Telescope, pages 30, and on pages 6 and 7 of this *Observer*.

Everyone's favorite guy in the sky, Orion, is coming, preceded in the high south by the meanderings of Eridanus the River, whose upper stretches are positioned between Orion, specifically the foot star Rigel, and Cetus to his west. The River starts abruptly west of Rigel and includes the nebulosity IC 2118 northwest of that star. The River's line of stars continues west and bends south to its Gamma star, northwest of which is NGC 1535, a two-ringed planetary nebula at 04^h 15^m -13° whose central star shines at magnitude 11.5. The course of the river then bounces back up to continue west and eventually down again, twisting back to the east before falling farther south. Faint fuzzies, a little knot of galaxies

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PRESIDENT'S MESSAGE

by Ron Hranac

In the November 2013 *Observer* "President's Message" I recommended the use of transient voltage surge suppression (TVSS) whenever astronomy gear is plugged in to commercial power. One could make the argument to just use battery power, in order to eliminate the risk of commercial power-related surge or transient damage to one's astro gear. Point taken, but hopefully your battery charger is protected by a point-of-use TVSS when you recharge your battery!

That said, what about those batteries? Have you given much thought to the care and maintenance of the battery or batteries that power your gear? Here are a few tips that you may find useful. I'm going to assume that you're using a moderate- to high-capacity rechargeable lead-acid battery as opposed to smaller alkaline, nickel cadmium (NiCd) or nickel metal hydride (NiMH) cells. Likewise, I'll assume that you're not using a car battery - they're designed to provide brief bursts of very high electrical current to start a car's engine, and are not recommended for repeated discharge-recharge cycles typical with amateur astronomy applications.

At the top of the list of tips is safety. Lead-acid batteries have an acid-based chemical inside called an electrolyte, which reacts with internal metallic plates to produce electricity. Lead-acid batteries comprise three major types: conventional flooded (similar to car batteries, with a liquid electrolyte), gel cell (has a gelatin-like electrolyte), and absorbed glass mat (AGM, which uses a fiberglass mat between the metallic plates to contain the electrolyte).



DAS President Ron Hranac during Solar Day at the Denver Museum of Nature & Science.

Image courtesy of Jeff Tropeano

These days the AGM battery is probably the most common type used for applications such as powering amateur astronomy gear.

Caution: The electrolyte in a lead-acid battery is a mixture of sulfuric acid and water. Exposure to the electrolyte is potentially dangerous, given the sulfuric acid in the mix. Overcharging a lead-acid battery may cause the release of flammable and potentially explosive hydrogen gas.

Store lead-acid batteries upright in a cool, dry location. If corrosion builds up on the terminals, clean them with baking soda and water. Consider applying a

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DAS SCHEDULE

DECEMBER

- 7 Open House (Open House begins at 5:00 P.M.)
- 14 DAS Holiday Party (See Back Page)
- 20 E-Board Meeting at Chamberlin (Begins at 7:30 P.M.)
- 21 Winter Solstice
- 25 Christmas Day

JANUARY

- 1 New Year's Day
- 3-5 EGK Dark Sky weekend
- 11 Open House (Begins at 5:00 P.M.)
- 17 General Membership Meeting at Olin Hall (Begins at 7:30 P.M.) Nomination of Officers
- 20 Martin Luther King Day
- 24 E-Board Meeting at Chamberlin (Begins at 7:30 P.M.)

Open House costs: If the skies are clear, \$2 per person (\$5/family), and \$1 per person in the event of inclement weather.

Public nights are held at Chamberlin Observatory every Tuesday and Thursday evenings beginning at the following times:

March 10 - September 30 at 8:30 P.M.

October 1 - March 9 at 7:30 P.M.

Costs to non-members are: \$3.00 adults, \$2.00 children.

Please make reservations via our website (www.denverastro.org) or call (303) 871-5172.

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The Executive Board conducts the business of the DAS at 7:30 p.m. at Chamberlin Observatory. Please see the Schedule of Events for meeting dates. All members are welcome.

www.denverastro.org

DECEMBER SKIES

(CONTINUED FROM PAGE 1)

(NGCs 991, 1022, 1035, 1042, 1048, 1052 and 1084) lie just west of η (eta) Eridanus at about $02^{\text{h}} 40^{\text{m}} -08^{\circ}$.

A southern swoop with no neck-craning: Start at Cetus in the south, under Pisces. To find this constellation, look for the Great Square of Pegasus. Below that is the circlet of Pisces, where the moon will be on the 9th. Down to the left from there is the body of Cetus—the Sea Monster (often depicted as a whale) around the location $01^{\text{h}} 30^{\text{m}} -10^{\circ}$. Now, swim beneath the huge air-breathing animal. At $00^{\text{h}} 50^{\text{m}} -25.5^{\circ}$ is NGC 253, the famous nearly edge-on spiral galaxy. Its rotating disk is mottled with gas and dust clouds. Above it five degrees is NGC 247, another spiral, below the β (beta) star of Cetus. If you went straight up another six degrees, passing β (beta) Cet, you'd find galaxy NGC 255 and planetary nebula NGC 246 (the Skull Nebula). To do so is to swoop in the wrong direction, but I got sidetracked. Back at NGC 253 we are near the South Galactic Pole. Now, swoop west to the bright star Fomalhaut in Pisces Austrinus. See what you can of the two galaxies ahead and behind Fomalhaut about 12-15 degrees—NGC 7507 and NGC 7361. NGC 7293 (the Helix Nebula) is northwest of the star at $22^{\text{h}} 31^{\text{m}} -21^{\circ}$. If you fancy faint fuzzies wander south of Fomalhaut, if that is possible from your position, to find many galaxies down in Grus the Crane, most of which will be below our horizon. A small batch of these, however, is around $23^{\text{h}} 00^{\text{m}} -37^{\circ}$ and may be visible: IC 5629 and IC 1459 plus NGC 7418 and NGC 7421.

We're swooping mighty low, the scope dragging on the ground and disturbing various tarantulas, scorpions and verminoid serpents as you continue west towards globular cluster M30 west of Capricorn at $21^{\text{h}} 42^{\text{m}} -23^{\circ}$. We've been here before but this time we're swooping, now up off the ground to find M2. You may have to shake the dust and critters from your telescope if you have a Newtonian, remembering to shake them out, not in, to your tube. Now, of course, they are free to crawl over to your warm feet. M2 is at $21^{\text{h}} 35^{\text{m}} -01^{\circ}$. Another big globular cluster, M15, is straight north of M2 at $+12^{\circ}$. Then, having swooped (swup?), brush the vermin off your shoes and get a warm drink from your thermos.

Solar system stuff: Geminid meteors on the 13th-14th. Jupiter rises in mid-evening, getting earlier as the month wears on. Venus is busy being the Evening Star, often mistaken for an airplane or a UFO in the southwest. ISON and Saturn rise in the morning. Merry Christmas to all, and don't forget the Club's Holiday Banquet on December 14! ★



COMET ISON (C/2012 S1) APPROACHES THE SUN NOV 18, 2013

On the night after full moon, and in twilight, comet ISON starts its show in its plunge toward the sun in this beautiful image made by Roger Clark. The bright star at the center is Spica, α (alpha) Virgo.

Technical: Roger used his Canon 1D Mark IV 16-megapixel digital camera, Canon 200 mm f/2.8 lens at f/3.2, ISO 1600. One hundred twenty eight 5-second exposures were combined in two ways. 1) Align on the comet, which moved during among the stars during the sequence. 2) Align on the stars. Then blend the two images together. Image obtained 5:02 to 5:37 am November 18, 2012 MST. Total exposure = 10.7 minutes.

Image © Roger Clark

ABOUT THE DAS

Membership in the Denver Astronomical Society is open to anyone wishing to join. The DAS provides trained volunteers who host educational and public outreach events at the **University of Denver's Historic Chamberlin Observatory**, which the DAS helped place on the National Register of Historic

Places. First light at Chamberlin in 1894 was a public night of viewing, a tradition the DAS has helped maintain since its founding in 1952.

The DAS is a long-time member in good standing of the **Astronomical League** and the **International Dark Sky Association**. The DAS's mission is to provide its members a forum for increasing and sharing their knowledge of astronomy, to promote astronomical education to the public, and to preserve Historic

Chamberlin Observatory and its telescope in cooperation with the University of Denver.

The DAS is 501 (c)(3) tax-exempt corporation and has established three tax-deductible funds: the Van Nattan-Hansen Scholarship Fund, the DAS-General Fund and the Edmund G. Kline Dark Site Fund.

More information about DAS activities and membership benefits is available on the DAS website at www.denverastro.org ★



NASA'S Space Place

THE MOST VOLCANICALLY ACTIVE PLACE IS OUT-OF-THIS-WORLD!

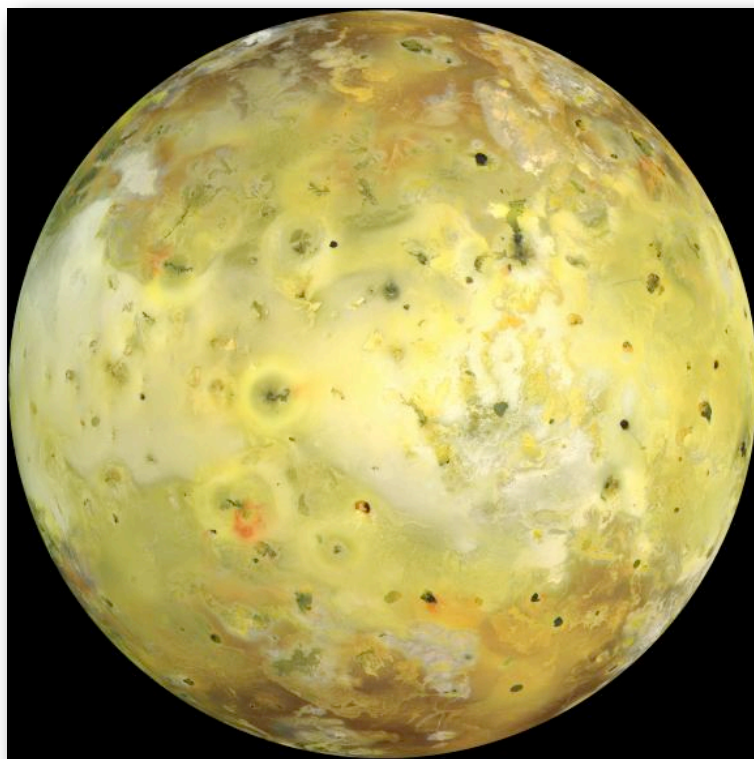
by Dr. Ethan Siegel

A Space Place Partners' article

Volcanoes are some of the most powerful and destructive natural phenomena, yet they're a vital part of shaping the planetary landscape of worlds small and large. Here on Earth, the largest of the rocky bodies in our Solar System, there's a tremendous source of heat coming from our planet's interior, from a mix of gravitational contraction and heavy, radioactive elements decaying. Our planet consistently outputs a tremendous amount of energy from this process, nearly three times the global power production from all sources of fuel. Because the surface-area-to-mass ratio of our planet (like all large rocky worlds) is small, that energy has a hard time escaping, building-up and releasing sporadically in catastrophic events: volcanoes and earthquakes!

Yet volcanoes occur on worlds that you might never expect, like the tiny moon Io, orbiting Jupiter. With just 1.5% the mass of Earth despite being more than one quarter of the Earth's diameter, Io seems like an unlikely candidate for volcanoes, as 4.5 billion years is more than enough time for it to have cooled and become stable. Yet Io is anything but stable, as an abundance of volcanic eruptions were predicted before we ever got a chance to view it up close. When the Voyager 1 spacecraft visited, it found no impact craters on Io, but instead hundreds of volcanic calderas, including actual eruptions with plumes 300 kilometers high! Subsequently, Voyager 2, Galileo, and a myriad of telescope observations found that these eruptions change rapidly on Io's surface.

Where does the energy for all this come from? From the combined tidal forces exerted by Jupiter and the outer Jovian moons. On Earth, the gravity from the Sun and Moon causes the ocean tides to raise-and-lower by one-to-two meters, on average, far too small to cause any heating. Io has no oceans, yet the tidal forces acting on it cause the world itself to stretch and bend by an astonishing 100 meters at a time! This causes not only cracking and fissures, but also heats up the interior of the planet, the same way that rapidly bending a piece of metal back-and-forth causes it to heat up internally. When a path to the surface opens up, that internal heat escapes through quiescent lava flows and catastrophic volcanic eruptions! The hottest spots on Io's surface reach 1,200 °C (2,000 °F); compared to the average surface temperature of 110 Kelvin



IO

Image credit: NASA / JPL-Caltech, via the Galileo spacecraft.

(-163 °C / -261 °F), Io is home to the most extreme temperature differences from location-to-location outside of the Sun.

Just by orbiting where it does, Io gets distorted, heats up, and erupts, making it the most volcanically active world in the entire Solar System! Other moons around gas giants have spectacular eruptions, too (like Enceladus around Saturn), but no world has its surface shaped by volcanic activity quite like Jupiter's innermost moon, Io! ★

PRESIDENT'S MESSAGE

corrosion inhibitor to the terminals. The latter is available at most retailers that sell batteries. Regularly inspect your battery's case for signs of swelling or cracking. Do not short-circuit the terminals when connecting or disconnecting wires or otherwise handling a battery, and keep jewelry away from the terminals. Gloves and safety glasses are a good idea. When it comes time to replace the battery, properly recycle it (I usually take old batteries to Batteries Plus)—batteries do not belong in landfills.

Charging lead-acid batteries is next on my list. The different battery types require different charging voltages and rates, as well as what is called float voltage once fully charged. Modern smart chargers are designed to operate with various types of batteries, and will avoid overcharging even if left connected for long periods. Some smart chargers can extend the life of older batteries, too. I use one called BatteryMINDER (<http://batteryminders.com/>),

which allows the user to select the charging rate and battery type. The charger can detect reversed polarity, as well as battery condition, and when in float mode generates a special electrical waveform that is said to prolong the life of lead-acid batteries.

Always fully recharge a battery as soon as possible after each use—never partially recharge a battery and don't let it sit too long in a discharged state. The recharging should be done in a cool, dry place that is adequately ventilated.

When using batteries in the field, keep in mind that the ambient temperature will affect their capacity. Colder temperatures will reduce capacity, which means the battery won't last as long as it does in warmer temperatures. At low enough temperatures a discharged battery may freeze. Not good!

Regardless of the temperature, never discharge a battery too far. Doing so may cause internal damage, and will generally shorten its life significantly. Follow the battery manufacturer's guidelines, and if

necessary, invest in a small digital multimeter to keep track of voltage when the battery is in use.

Proper fusing is critical, too. I use a RIGrunner power distribution strip that has sockets for automotive style fuses (www.westmountainradio.com/product_info.php?products_id=rr_4005_c). The input to the power distribution strip from the battery has a 40 amp fuse, and the outlets to the equipment are individually fused with smaller values suitable for the specific equipment. On my large 100 amp-hour (Ah) battery, both leads connected to the battery are protected with in-line 40 amp fuses. My smaller 18 Ah and 7 Ah batteries use the fusing in the power distribution strip.

Rechargeable batteries give us the flexibility and portability of operating our astro gear in remote locations without having to rely upon commercial power, but they do require proper care, maintenance, and attention to safety. ★

(CONTINUED FROM PAGE 2)

MEET YOUR FELLOW ASTRONOMER

by Dena McClung

This month's member profile features Naomi Pequette. Naomi has been immersed in astronomy since she was twelve years old, when her science teacher at Englewood Leadership Academy took her class to the Colorado Springs Challenger Center. She and her fellow students had roles as space station astronauts and mission controllers tasked with mapping the orbit of a comet on a collision course with the station.

Soon thereafter, she picked out a 10-inch Dobsonian at S&S Optika, visiting it regularly until she turned thirteen and had enough money to purchase it. She and her father, Jim, joined DAS during that time. A year later (after learning the night sky), she was allowed to add the Intelliscope piece.

While volunteering in high school at the Denver Museum of Nature and Science's Space Odyssey exhibit, Naomi started a teen astronomy club and got hooked on doing outreach. Citing support from her family, her DAS and DMNS friends and Cathie Havens at S&S, Naomi finished high school early and started attending University of Denver at age 16, earning a physics degree with a concentration on astrophysics. Her thesis concerned theoretical astrophysics and involved the use of computerized models. During this time she also became a certified telescope operator at Chamberlin Observatory. She has done research and had astronomy internships at a variety of locations, including the Meyer-Womble Observatory atop Mt. Evans, Kitt Peak, and on Nantucket Island. Her observing has in-

cluded visual and radio astronomy, including one series with emphasis on galaxies. She also served as a DAS board member for one year.

Naomi is now considering entering a graduate program with a goal of becoming a science educator. She would like to inspire kids to become astronomy researchers, ideally through a paid position with a museum. She would welcome the challenge of customizing and tailoring presentations for guests ranging from pre-schoolers to PhDs. But she says that her dream job would be to revamp the Georgetown Energy Museum, making it more of a science center, creating more comprehensive displays, and perhaps incorporating astronomy.

She currently works six days a week, splitting her time between S&S Optika and a Barnes and Noble bookstore, where she leads the team that sells their Nook E-Reader. After a three-month stint during which she worked seven days a week a few years ago, she finds she relishes her one day off.

Naomi enjoys the camaraderie of belonging to the DAS, and says that the wide variety of members' expertise, interests and professional backgrounds have been an incredible pool of resources for her. She likes doing visual astronomy in groups or social settings such as star parties, and now owns three telescopes.

Naomi likes dancing, and performed ballet for sixteen years beginning at age three. She enjoys doing photography in the mountains, but says that astro-photography is too much work.



NAOMI PEQUETTE

Image courtesy: Naomi Pequette

She describes herself as a Sci-Fi geek, attending conventions in costume. During college, she spent her Friday nights playing games and watching "Big Bang Theory" with her fellow "science nerds." ★

BEGINNER'S BITS: WHY DOES APERTURE MATTER?

by Lisa Judd

One question the uninitiated may ask at a star party is "what power is this telescope?" Well, by "power," does that mean light gathering power or power of magnification? If the question is more specific, the question is usually what magnification the telescope gives. But if you want to know how a telescope works, the crucial factor isn't magnification, it's aperture—a term for how far across the main mirror (or in the case of refractors, the main lens) is, easily discernible by noting how wide the tube is. Once the light from an object is collected by this girth, magnification is achieved by putting different eyepieces into the telescope.

A well-used slang term for a telescope is a "light bucket", which is somewhat like a rain bucket except that it's collecting photons, then focusing them into a point and throwing them through an eyepiece into your eye. The effect is the same as if you had eyes the size of the aperture of the scope; after all, the little pupil diameter will only let so much light in, so we need optical help to let a lot more light into your eye. If you see an ad that tries to sell a telescope according to what kind of magnification it gives, walk away immediately and go to a specialty store to get a decent one.

To further the concept, remember that many astronomical objects are as big as the moon, so the reason you can't see them naked-eye is not because they're too small, but because they're too dim. Then when you move to binoculars to a small scope to a medium scope to a large scope, you'll see more and more detail and the object will appear brighter each time, but with no change in size. It's a microscope's job to make small things look bigger; a telescope's job is to make dim

things look brighter. Eyepieces also have aperture, and to confuse the issue, the term "high power" and "low power" always means magnification when you're talking about eyepieces.

There is one good exception to caution you about, though – the type of object you're looking at. While most nebulae, clusters and galaxies are large and dim, planets are small and bright. So if you look at a planet at a public star party and are disappointed with the small view, don't think you should go buy a high-magnification-friendly refractor and then try to point it at a deep-sky object to expect better views. The two types of targets are like apples and oranges, and unless you're really specialized, you should want a scope that allows you to view a variety.

As mentioned previously, the eyepiece you use with the scope also has an aperture, and higher power (a.k.a. higher magnification) eyepieces let in much less light, which is no problem for bright planets. Most scopes come with a low power and a high power eyepiece, so you can use the former for deep sky and the latter for planets. There's one type of object that's sort of a catch-22, though—planetary nebulae, named as such just because they're round. There's a few large ones and a few small-but-bright ones, but in general it's tough to see a small, dim, round nebula, especially if it's just a ghostly ring around a central star. If you're having trouble seeing these things, the only solution is darker skies and/or more aperture. As you become more experienced, you'll catch "aperture fever"—that main symptom is to wish you had a bigger scope. ★



Roger Clark created a series of views (here we see just one) of the eastern sky with comet ISON marked using *Stellarium*, a planetarium software. This view shows December 15, 2013 at 6:00 a.m. To see the entire series, go to: <http://www.clarkvision.com/articles/astro-ison-position/>.

ISON UPDATES

Wow—if you, like me, followed the perihelion approach and aftermath of Comet ISON, you were subjected to quite the roller-coaster ride. Is it dead? Is it alive? Is there anything left? It seems that the consensus is that the comet fragmented and what may have been even a small left-over nucleus, may not be much more than dust. The jury is still out, but ISON probably won't put on the December show we had hoped for.—*Patti Kurtz*, *Observer editor*

From *Sky & Telescope Magazine's* Alan MacRobert:

November 30, 6 p.m. EST: More fading, and John Bortle revises his forecast. John Bortle withdraws his relatively optimistic forecast posted yesterday. He writes,

The comet's appearance only suggests a progressive decline now.

While ISON's photometric behavior up to and around perihelion did seem to mimic that of 1962's impressive Comet Seki-Lines, the failure of ISON's current cloud-like coma to exhibit any area of condensation as the cloud thins, and its fading and growing diffuseness, do not correspond to Seki-Lines' post-perihelion regeneration . . .

To be similar in behavior with C/Seki-Lines, ISON would be developing an increasingly small, dense, very bright condensation within the coma. Likewise, the intensity and length of the tail(s) would be rapidly growing, just as we saw in the case of 2011 W₃ Lovejoy following its perihelion . . .

Following a 2- to 4-day blind period after the comet leaves spacecraft view, Bortle expects only a "large, low-surface-brightness, diffuse cloud showing just a trace of tail"—in other words a challenge object for skilled astrophotographers and image processors, not visual observers—if anything at all.

The previous was reprinted with permission from *Sky & Telescope* magazine.

The latest blog article, as of this printing from Karl Battam, cometary scientist from CION (NASA Comet ISON Observing Campaign) wrote *In ISON's Wake, a Trail of Questions:*

“• What happened to comet ISON? Is it still alive?”

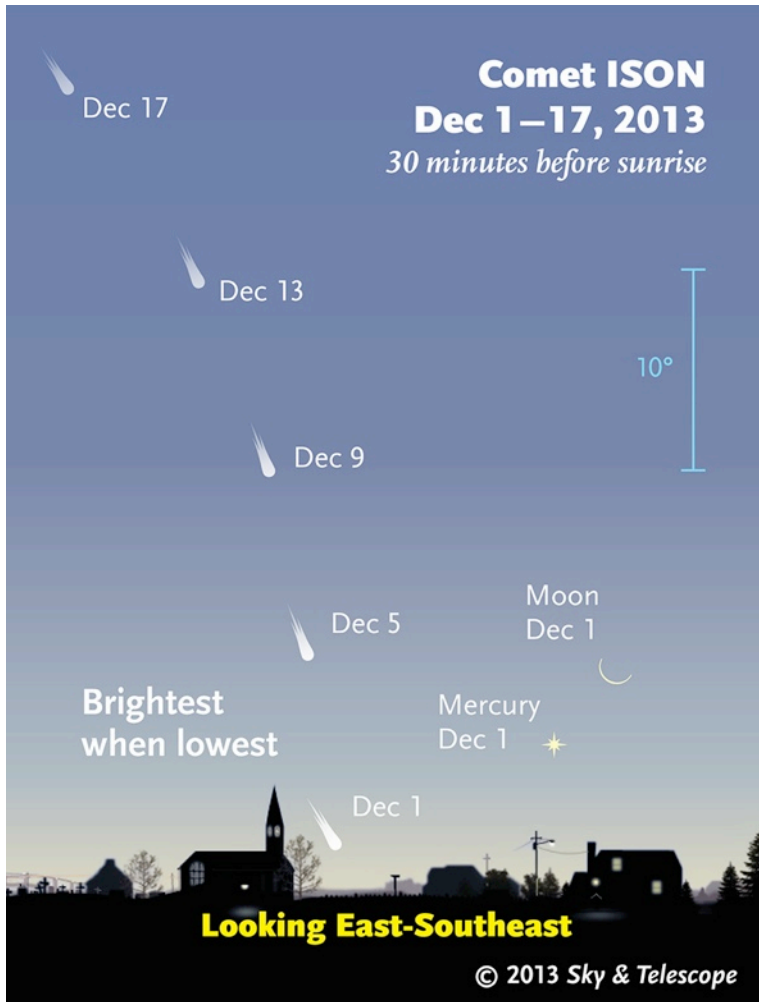
Great question, and we recommend you find a comet expert to answer that. ... [crickets] ... Sigh, OK I guess that's us. Well we don't have a very clear answer yet but there are a couple of things we can say for sure. First, during its passage through the Sun's million-degree corona, its dusty/gassy coma got very much burned away, though clearly some fine dust survived (which is the fine cloudy stuff you see being pushed away from the Sun). Second, something did emerge from the corona. It could be a comet, or just the remains of what once was. We can't tell right now.

Certainly there's lots of dust, and Matthew and I hesitantly lean towards thinking that there's something there producing dust, but that could be a small nucleus, or it could be a pile of rubble and comet chunks that will dissipate in the coming days. The key thing we need to find out—and as yet we have no data about this as ISON is too faint and close to the Sun—is whether there is any gas being produced. If there's gas, there's almost certainly an active nucleus; if there's almost no gas then probably no nucleus.

• If there is a nucleus, how big is it?

There is no way we can tell this from the spacecraft data we have right now. We will need to wait for Hubble to be able to observe the comet, which will be in mid-to-late December, I believe. What I can tell you is that however big ISON's nucleus was a few weeks ago, it is much smaller now!

Continued on the next page



• Will it be naked eye visible? When? How bright?

This is definitely the toughest question but also the most frequent. We still don't know if it will be naked eye but based on its current brightness in the LASCO images—which is around magnitude +5 and fading—it does seem unlikely that there will be much to see in the night sky. I suspect that some of the outstanding astrophotographers around the world will be able to get something, but I doubt it will be as spectacular as before perihelion. I hope I'm wrong though." (<http://www.isoncampaign.org/blog/1>)

ISON isn't the only comet we have to look at! C/2013 R1 Lovejoy is still putting on a good show. Check <http://earthsky.org/space/how-to-see-comet-lovejoy-c2013-r1-charts-photos> for a good finder chart. ★



Photos, clockwise: Above right: Ricardo Viera shot ISON on November 19. Below right, Darrell Dodge shot ISON on October 26th at the Dark Site. Details: modified Canon 450D, through an 8-inch Ritchey-Cretien at f/8. 12 x 90 sec. RGB. Processed with Nebulosity and CS5. Below left is Sorin's contribution: (<http://soggyastronomer.com>) on November 20th, 2013 at 5:50-5:54 A.M. from Observatory Park in Denver (heavy light pollution). Three 1-min subs taken with 1-minute intervals between tracking on the comet. Canon t3i prime focus with 6-inch f/9 1370mm Astro-Tech Ritchey-Chrétien astrograph plus Astro-Tech field flattener.



WELCOME NEW DAS MEMBERS!

- John Dranchak
- David Duncan
- Kristi Espineira
- Dirk Huizenga
- Daniel Kerley
- Nicole Kerley
- Tim Kish
- Karen McGill
- R. B. Minton
- David Reilly
- William Russell
- Marcus Tuepker
- Kurtis Zinger



Season's Greetings!

Come join us for our annual holiday party, specially put together by the staff at the Embassy Suites! On the menu will be **Chicken Scallopini**, or **Eggplant Neapolitan** for those that prefer a vegetarian dish, plus salad, rolls, chef's choice dessert and beverages. There's also a cash bar and festive decor, plus **Carol Shouldice's choral quartet "High Country Gold"** to keep us cheery.

We'll need a headcount, so *please reserve by December 5th*.

The party takes place on **December 14th**, from 6:00 until midnight (or earlier), at the **Embassy Suites** at 7525 E. Hampden. The property is four blocks east of I-25—turn left at the 5th traffic light and follow the signs to the hotel entrance.

Cost is \$20; you can either reserve and pay online at denverastro.org/holidayparty.html, or mail a check to treasurer Brad Gillman at 7003 S. Cherry Street, Centennial, CO 80122.

Come and enjoy the fun!



The Denver Astronomical Society
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